CLAIMS

WHAT IS CLAIMED:

1. A method, comprising:

processing at least one semiconductor wafer;

acquiring metrology data from said processed semiconductor wafer;

accessing data from a reference library comprising optical data relating to a poly-silicon formation on a semiconductor wafer;

comparing said metrology data to data from said reference library; and

performing a fault-detection analysis in response to said comparison of said metrology data and said reference library data.

2. The method described in claim 1, further comprising generating said reference library that comprises optical data relating to characteristics of a plurality of structures of a semiconductor wafer.

3. The method described in claim 1, wherein processing at least one semiconductor wafer comprises performing a photolithography process on said semiconductor wafer.

4. The method described in claim 3, wherein processing at least one semiconductor wafer further comprises performing an etch process on said semiconductor wafer.

5. The method described in claim 1, wherein processing at least one semiconductor wafer comprises forming a grating structure that runs across a field region and across an active region on the semiconductor wafer.

6. The method described in claim 5, wherein acquiring metrology data from said processed semiconductor wafer comprises:

illuminating at least a portion of said grating structure; and

measuring reflected light resulting from said illumination to generate an optical signature of said grating structure.

7. The method described in claim 6, wherein acquiring metrology data from said processed semiconductor wafer further comprises performing scatterometry data acquisition.

8. The method described in claim 7, wherein performing a fault-detection analysis in response to said comparison of said metrology data and said reference library data comprises:

determining if at least one of a necking error based upon said optical signature of said grating structure and a breaking error in a poly-silicon line associated with said grating structure exists;

determining if a step height between said field region and said active region is excessive in response to at least one of said determination that a necking error exists and a determination that a poly-silicon structure is broken; and

determining if an over-etching error exists in response to at least one of said determination that a necking error exists and a determination that said breaking error exists.

9. The method described in claim 8, further comprising performing a process control compensation in response to said comparison of said metrology data and said reference library data.

10. The method described in claim 9, wherein comprising performing a process control compensation in response to said comparison of said metrology data and said reference library data comprises modifying at least one control parameter in response to said comparison of said metrology data and said reference library data.

11. A method, comprising:

processing at least one semiconductor wafer;

generating a reference library, said reference library comprising a plurality of optical data relating to a plurality of poly-silicon structures formed on said semiconductor wafer;

illuminating at least a portion of said semiconductor wafer;

measuring reflected light off said polysilicon structures to generate an optical signature of said poly-silicon structures;

comparing said measured reflected light related to said poly-silicon structure with optical data from said reference library;

performing at least one of a fault-detection analysis and a process control compensation in response to said comparison of said measured reflected light and said optical data from said reference library.

12. The method described in claim 11, wherein illuminating at least a portion of said semiconductor wafer further comprises illuminating a poly-silicon structure on said semiconductor wafer.

13. The method described in claim 12, wherein illuminating a poly-silicon structure on said semiconductor wafer comprises illuminating a poly-silicon line on said semiconductor wafer.

14. The method described in claim 11, wherein illuminating at least a portion of said semiconductor wafer comprises illuminating an active region and a field region on said semiconductor wafer.

15. The method described in claim 11, wherein measuring reflected light resulting from said illumination to generate an optical signature of said poly-silicon structure comprises performing scatterometry data acquisition.

16. The method described in claim 11, wherein performing a fault-detection analysis in response to said comparison of said measured reflected light and said optical data from said reference library comprises:

determining if at least one of a necking error based upon said optical signature of said grating structure and a breaking error in a poly-silicon line associated with said grating structure exists;

determining if a step height between said field region and said active region is excessive in response to at least one of said determination that a necking error exists and a determination that a poly-silicon structure is broken; and

determining if an over-etching error exists in response to at least one of said determination that a necking error exists and a determination that said breaking error exists.

17. The method described in claim 11, wherein performing a process control compensation in response to said comparison of said measured reflected light and said optical data from said reference library comprises modifying at least one control parameter in response to a said comparison of said measured reflected light and said reference library data

18. A system, comprising:

a computer system;

a manufacturing model coupled with said computer system, said manufacturing model being capable of generating and modifying at least one control input parameter signal;

a machine interface coupled with said manufacturing model, said machine interface being capable of receiving process recipes from said manufacturing model;

a processing tool capable of processing semiconductor wafers and coupled with said machine interface, said first processing tool being capable of receiving at least one control input parameter signal from said machine interface;

a metrology tool coupled with said first processing tool and said second processing tool, said metrology tool being capable of acquiring metrology data;

a scatterometry reference library, said scatterometry reference library comprising optical data related to a plurality of poly-silicon structures; and

a scatterometry data error analysis unit coupled to said metrology tool and said scatterometry reference library, said scatterometry data error analysis unit capable of comparing said metrology data to corresponding data in said scatterometry reference library and calculating at least one of a necking error and a poly-silicon structure break error in response to said comparison.

19. The system of claim 18, wherein said computer system is capable of generating modification data for modifying at least one control input parameter in response to said calculation of at least one of a necking error and a poly-silicon structure break error.

20. The system of claim 19, wherein said manufacturing model is capable of modifying said control input parameter in response to said modification data.

21. The system of claim 18, wherein said metrology tool is a scatterometer.

22. An apparatus, comprising:

means for processing at least one semiconductor wafer;

means for acquiring metrology data from said processed semiconductor wafer;

means for accessing data from a reference library comprising optical data relating to a poly-silicon formation on a semiconductor wafer;

means for comparing said metrology data to data from said reference library; and

means for performing a fault-detection analysis in response to said comparison of said metrology data and said reference library data.

23. A computer readable program storage device encoded with instructions that, when executed by a computer, performs a method, comprising:

processing at least one semiconductor wafer;

acquiring metrology data from said processed semiconductor wafer;

accessing data from a reference library comprising optical data relating to a poly-silicon formation on a semiconductor wafer;

comparing said metrology data to data from said reference library; and

performing a fault-detection analysis in response to said comparison of said metrology data and said reference library data.

24. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in

claim 23, further comprising generating said reference library that comprises optical signature data relating to characteristics of a plurality of structures of a semiconductor wafer.

25. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 23, wherein processing at least one semiconductor wafer comprises performing a photolithography process on said semiconductor wafer.

26. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 25, wherein processing at least one semiconductor wafer further comprises performing an etch process on said semiconductor wafer.

27. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 23, wherein processing at least one semiconductor wafer comprises generating a grating structure that runs across a field region and across an active region on the semiconductor wafer.

28. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 27, wherein acquiring metrology data from said processed semiconductor wafer comprises:

illuminating at least a portion of said grating structure; and

measuring reflected light resulting from said illumination to generate an optical signature of said grating structure.

29. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 28, wherein acquiring metrology data from said processed semiconductor wafer further comprises performing scatterometry data acquisition.

30. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 29, wherein performing a fault-detection analysis in response to said comparison of said metrology data and said reference library data comprises:

determining if at least one of a necking error based upon said optical signature of said grating structure and a breaking error in a poly-silicon line associated with said grating structure exists;

determining if a step height between said field region and said active region is excessive in response to at least one of said determination that a necking error exists and a determination that a poly-silicon structure is broken; and

determining if an over-etching error exists in response to at least one of said determination that a necking error exists and a determination that said breaking error exists.

31. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in

claim 30, further comprising performing a process control compensation in response to said comparison of said metrology data and said reference library data.

32. The computer readable program storage device encoded with instructions that, when executed by a computer, performs the method described in claim 31, wherein comprising performing a process control compensation in response to said comparison of said metrology data and said reference library data comprises modifying at least one control parameter in response to said comparison of said metrology data and said reference library data.